Myth: All telemedicine roads and cables lead to MCG and Augusta.
Fact: Our hub-and-spoke configuration allows remote sites connectivity to a secondary hub site, where expert consultation will be available. If expertise is not available at the hub site, remote sites simply request a consultation from one of two tertiary-care sites, MCG or Emory University or any other site on the network. The result for most patients is they don't have to travel to the secondary or tertiary site to receive expert consultations. In fact with the Georgia system, approximately 86 percent of patients seen via telemedicine between 1991 and 1994 for specialty medical consultations did not require travel to a tertiary-care center; rather remained in their own communities.

Archbold Memorial Hospital Puts Telemedicine in the Spotlight

Archbold Memorial Hospital's Telemedicine Coordinator Susan Haberkorn with hospital board members Greg Adams, Russell Chubb and C. Martin Wood.

Telemedicine hub site John D. Archbold Memorial Hospital in Thomasville and its remote sites of Brooks County, Grady General and Mitchell County Hospitals, have maximized the exposure of telemedicine by targeting not only healthcare providers but hospital support staff and the community as well.

For physicians, Archbold sponsored a six-hour open house, serving a finger-food breakfast and lunch. Of the area's 100 physicians, 60 stopped in for some hands-on exposure to telemedicine. A six-minute video tour of telemedicine and "how to" handout was developed and presented at department meetings for those physicians who didn't attend the open house.

All remote-site physicians had the opportunity to see the system in medical staff meetings. And, demonstrations were conducted for all hospital board meetings with newspaper, radio and television coverage of these demos. Archbold also connected with each of its remote sites for a special demo for the media soon after the system was installed.

Demos are being done for many hospital departments such as rehabilitation which resulted in department members using telemedicine to evaluate candidates for their services at remote sites. To help ensure that all members of the hospital staff are informed about Archbold's role in this new form of healthcare delivery, telemedicine also has been demonstrated to support staff such as environmental services.

As of mid-September, the system had been used for cardiology consults and plans were in the works for an orthopedic follow-up visit. Archbold also is investigating working with the Medical College of Georgia Children's Medical Center to develop a pediatric pulmonology clinic.

Hospital officials say through about 30 linkages, the staff has had fun while working out the "bugs" and learning the ropes of using telemedicine and that these many experiences have made them very comfortable with this new technology. ■

Taking Telemedicine Into the Home

...continued from page 1

know if we can avoid a single hospitalization of these patients, we are saving a minimum of $25,000."

"A large percentage of utilization and hospital costs is attributable to a very small segment of the population," echoed Dr. Daniel W. Rahn, Vice Dean for Clinical Affairs in the MCG School of Medicine and Director of Clinical Practice for MCG Hospital and Clinics. "The plan is to see whether contact on a regular basis using telemedicine can stabilize their clinical condition, reducing their readmission rate and improving their health status, including the psychological condition of the whole family, while reducing costs."

Jim Toler and other researchers at Georgia Tech's Bioengineering Center in conjunction with Dr. John Searle, technical director of the MCG Telemedicine Center, are assessing pertinent technology already available and developing computer software and different types of diagnostic devices still needed. Technology already developed at the university—such as a hand-held radar device that measures minute measurements of the chest wall to provide data on heart and breathing rates—is being incorporated.

It's important that this home telemedicine system uses software that provides detailed, easy instructions for operation and that it takes into account the physical limitations of some patients, said Mr. Toler, Principal Research Engineer at the Bioengineering Center. Dr. Sanders envisions icons, such as a picture of the heart, that a patient can simply touch to activate a program that will measure his heart rate. Mr. Toler and fellow Georgia Tech researchers envision the electronic house call ultimately being integrated into something such as a comfortable, wingback chair.

At the early January press time of *The Telemedicine Connection*, work was nearly complete on the working prototype for the electronic

Editor's Corner

Laura Adams,
Director of Operations
Medical College of Georgia Telemedicine Center

Greetings from the staff of the Medical College of Georgia Telemedicine Center in this new year. All of us in Augusta thank you for your time and talents in establishing Georgia's pioneering telemedicine program. As we have worked together toward improved healthcare for Georgians, we have gained many new friends. We thank you for that opportunity as well and wish all of you and your families well in 1996.

We begin 1996 with the introduction of Dr. Max Stachura. Max fills the new role of Clinical Director and is serving as the Interim Telemedicine Center Director to smooth the transition of Dr. Jay Sanders' imminent departure *(see story page 1)*. As most of you know, Dr. Sanders has been elected President of the American Telemedicine Association and will soon assume that role. Dr. Sanders will continue his Eminent Scholar duties until his departure. I know you all join me in thanking Dr. Sanders for his valuable contributions to the field of telemedicine and in wishing him the best in his future endeavors. Please also join me in welcoming Dr. Stachura to our telemedicine family. Telemedicine is not new to Dr. Stachura, as he has conducted numerous consultations using both the original and the new system. Max is a clinical resourse available to you in your individual program development and provider education endeavors.

The Georgia Institute of Technology's development of the patient database, a computer network of information about patients seen via telemedicine, is progressing extremely well with initial testing complete. Field testing by selected sites followed by statewide implementation is expected in the first quarter of this new year. We are currently developing the two-hour training program that HTI-Link will provide on site and will begin contacting you to schedule your training.

Development of the Telemedicine Standardized Patient Program is underway with field testing scheduled for January *(see story next issue)*. Many thanks to the coordinators at Hamilton Medical Center, Dalton; Archbold Medical Center, Thomasville; and Bacon County Hospital, Alma, for dedicating time to be on the Development Team.

As you all probably know, we recently have experienced some technical difficulties with multi-point connections, such as those used in operations training, and have run exhaustive multi-point tests in an attempt to identify the problems. We appreciate everyone's patience and understanding with delays in operations training. In addition to discovering a discrepancy with the multi-point connection units set up at Bell South, we found an audio inconsistency between the distance learning and telemedicine sites. Dr. John Searle, our technical director, has developed new audio specifications for each telemedicine site to ensure compatibility. HTI-Link is in the process of making these changes. We plan to conduct additional tests and expect to reschedule the postponed operations training for the eight sites affected early this year.

Please mark your calendars for the Second Annual Georgia Statewide Telemedicine Program Conference. The Medical Center of Central Georgia in Macon will host the 1996 conference Aug. 23-24. We again will survey all sites and physicians in the state for your suggestions about the conference content so start thinking about what topics you would like presented. ■

Myth: There is no reason to believe health services will improve using telemedicine.
Fact: Operational programs have demonstrated the use of communications technology in healthcare may result in improved service delivery. One published study compares closed-circuit television with face-to-face interviews in psychiatry, concluding that interviews via closed-circuit television can be an effective method of mental healthcare delivery. This appears to support similar findings from studies completed over two decades ago. MCG has successfully conducted more than 550 telemedicine consultations, utilizing a wide-range of medical specialties such as cardiology, neurology, dermatology and infectious disease.

house call. The system should be ready for testing in the first quarter of this year.

For the purposes of the study, the 25 test homes likely will be connected to a physician's assistant or nurse practitioner working under the direction of an MCG or Eisenhower physician.

During the study period, researchers will look at issues such as whether this electronic house call actually helps patients stay healthier and out of the hospital and, on the flip side, whether having healthcare so handy causes overuse, Dr. Sanders said.

Study participants won't be charged, but cost of care will be tracked, Dr. Rahn said, to examine issues such as whether the cost of the system will be offset by patients not having to go to a high-cost healthcare facility.

As a second parallel initiative, the developing technology will be tested in a nursing-home setting where it also will reach out to people with chronic health problems.

"You are dealing with a population of patients who are quite ill; they have lots of diabetes and hypertension and strokes and heart disease," said Dr. Tom Jackson, MCG geriatrician and Medical Director of Salem Nursing and Rehabilitation Center of Augusta where telemedicine will be tested.

"The advantage of telemedicine is that it should substantially improve all the practical reasons why nursing home care is hard to do," Dr. Jackson said. Administrators have difficulty hiring physicians to work fulltime in a nursing home; more typically doctors such as Dr. Jackson visit as often as they can and are paged when problems arise. "I estimate that about one-third of the phone calls would be better handled if you could look at the patient with telemedicine," he said. Telemedicine technology, which will be available in Dr. Jackson's MCG office and his home, will let him see the patient without making a trip.

...continued on page 4

The Telemedicine Connection

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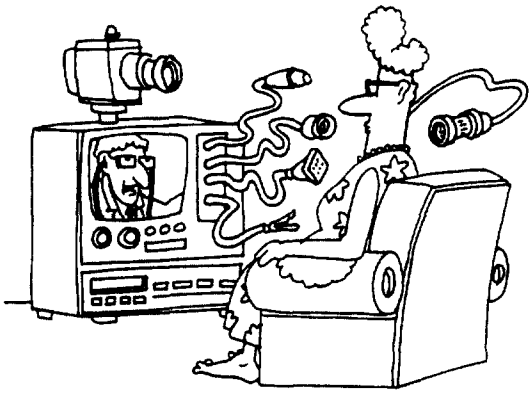
Taking Telemedicine Into the Home

...continued from page 3

Another grant initiative will place Eisenhower, the Army's only tertiary-care facility in the Southeast, on the Georgia Statewide Telemedicine Program, said Jack Horner, Director of Eisenhower's Center for Total Access.

Eisenhower will be a part of the 59-site Georgia network being established in hospitals, outpatient clinics and correctional facilities across the state. "Telemedicine will facilitate our outreach to the beneficiaries of military healthcare in the state of Georgia," Mr. Horner said. "As an example, if we have retirees living in rural Georgia who live far from a military medicine facility, we will have access to them." Mr. Horner sees telemedicine as one more step in destroying artificial barriers between medical providers such as MCG and Eisenhower as well as a mechanism for improving related issues such as patient education and health-sciences education.

"We are about to become accustomed to having all sorts of services provided to us in our living room," Dr. Sanders said. "Many companies are looking at providing you, as a consumer, interactive banking, entertainment and shopping at home so you can literally look at a grocery store's produce section and say, 'I want that, that and that.' If that sounds



foreign to you, our kids are going to say, 'Mom, you mean you didn't have that when you grew up?'"

Dr. Sanders says telemedicine will one day have a place in everyone's home—much like home banking—as it moves into the area of keeping healthy people healthy, not just treating or averting complications in the sick. "We want to keep the person from becoming a patient. Having the ease of access of this kind of system will allow people to get information that will keep them from seeking out a physician or seeking out an emergency department to find out whether they are sick or not." ■

The Telemedicine Connection.

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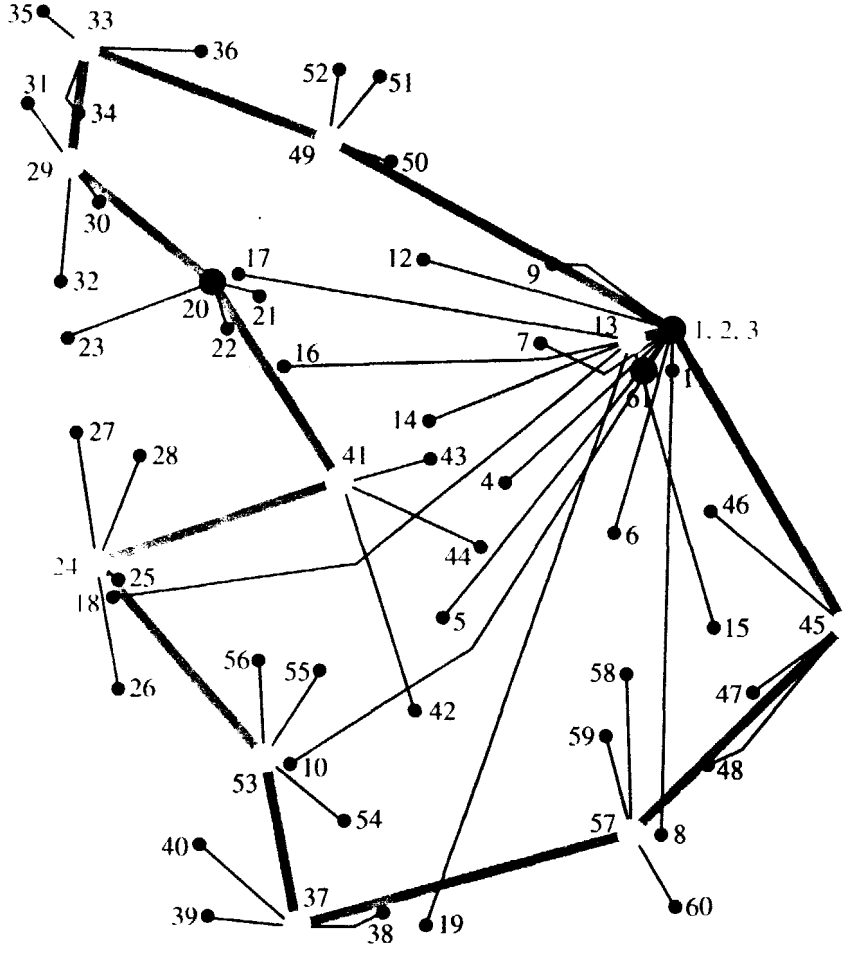
Augusta, Georgia 30912-1655

Georgia Statewide Academic and Medical System

Georgia Statewide Telemedicine Program (GSTP)



● Telemedicine Tertiary Hub Site

Telemedicine Secondary Hub Site

• Telemedicine Remote Site

Fiber Optic Backbone

1, 2, 3	**Medical College of Georgia, *Augusta***
4	Johnson County Center for Community Health, *Wrightsville*
5	Dodge County Hospital, *Eastman*
6	Emanuel County Hospital, *Swainsboro*
7	Tri-County Health Systems, Inc., *Warrenton*
8	Ware County Health Department, *Waycross*
9	Wills Memorial Hospital, *Washington*
10	Phoebe Putney Hospital Neonatal Nursery, *Albany*
11	Gracewood State School and Hospital, *Gracewood*
12	Family Counseling Center of Athens, *Athens*
13	**Augusta State Medical Prison, *Grovetown***
14	Men's State Prison, *Hardwick*
15	Georgia State Prison, *Reidsville*
16	Jackson State Prison, *Jackson**
17	Metro State Prison, *Atlanta**
18	Jack T. Rutledge State Prison, *Columbus**
19	Valdosta State Prison, *Valdosta**
20	**Emory University Hospital, *Atlanta***
21	Rockdale Hospital, *Conyers*
22	Tanner Medical Center, *Carrollton*
23	TBA
24	**The Medical Center, *Columbus***
25	Muscogee County Jail, *Columbus*
26	Southwest Georgia Regional Medical Center, *Cuthbert*
27	West Georgia Medical Center, *LaGrange*
28	TBA
29	**Floyd Medical Center, *Rome***
30	North Georgia Medical Associates, *Taylorsville*
31	TBA
32	TBA
33	**Hamilton Medical Center, *Dalton***
34	Gordon Hospital, *Calhoun*
35	North Georgia Family Physicians, *Ringgold*
36	North Georgia Medical Center, *Ellijay*
37	**Archbold Memorial Hospital, *Thomasville***
38	Brooks County Hospital, *Quitman*
39	Grady General Hospital, *Cairo*
40	Mitchell County Hospital, *Camilla*
41	**The Medical Center of Central Georgia, *Macon***
42	Dorminy Medical Center, *Fitzgerald*
43	TBA
44	TBA
45	**Savannah Memorial Medical Center, *Savannah***
46	Bulloch Memorial Hospital, *Statesboro*
47	Liberty Regional Medical Center, *Hinesville*
48	Wayne Memorial Hospital, *Jesup*
49	**Northeast Georgia Medical Center, *Gainesville***
50	Banks-Jackson-Commerce Medical Center, *Commerce*
51	Habersham Medical Center, *Demorest*
52	White County Neighborhood Healthcare Center, *Cleveland*
53	**Phoebe Putney Memorial Hospital, *Albany***
54	Colquitt Regional Medical Center, *Moultrie*
55	Crisp Regional Hospital, *Cordele*
56	Sumter Regional Hospital, *Americus*
57	**Satilla Regional Medical Center, *Waycross***
58	TBA
59	Bacon County Hospital, *Alma*
60	Charlton County Hospital, *Folkston*
61	**Eisenhower Army Medical Center, *Ft. Gordon***

*Served by GDC mobile telemedicine van

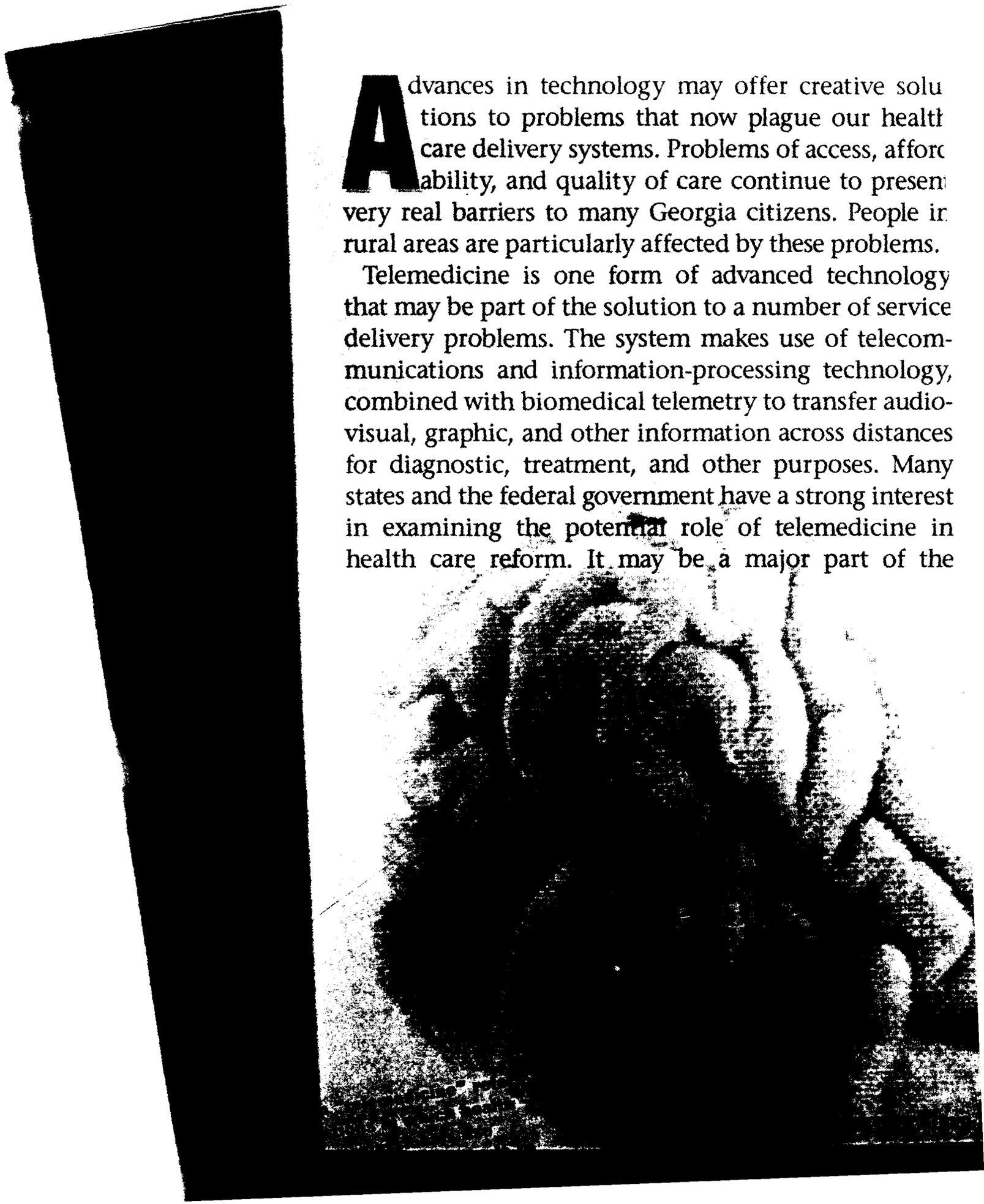
TELEMEDICINE

Is The

By R. Kevin Grigsby, D.S.W., LCSW,
and Jay

Advances in technology may offer creative solutions to problems that now plague our health care delivery systems. Problems of access, affordability, and quality of care continue to present very real barriers to many Georgia citizens. People in rural areas are particularly affected by these problems.

Telemedicine is one form of advanced technology that may be part of the solution to a number of service delivery problems. The system makes use of telecommunications and information-processing technology, combined with biomedical telemetry to transfer audio-visual, graphic, and other information across distances for diagnostic, treatment, and other purposes. Many states and the federal government have a strong interest in examining the potential role of telemedicine in health care reform. It may be a major part of the



solution to the problem of an inadequate distribution of health care resources.

Telemedicine is not new. In 1924, *Radio News*, a British publication, featured a story about the "Radio Doctor" that included an illustration of a child being examined by a physician over a video screen. Today telemedicine is a reality, not science fiction. Over the last three decades, there have been a number of projects that used telecommunications technology to link health care practitioners.

The term "telemedicine" refers to situations in which health care professionals use telecommunication channels to communicate with each other or their patients, with the goal of improving in some way the delivery of health care services. This may include information-processing technology and may be as basic as the telephone or fax, or as sophisticated as two-way, interactive audiovisual exchange utilizing specifically adapted medical instruments. The common elements of the exchange include the patient (and information about the patient), the health care provider, the specialist, and some type of electronic signal that carries medically-related information between at least two parties. Telemedicine has been used in psychiatry, ophthalmology, radiology, and other medical specialties. The technology has been deployed in a number of rural areas, in inner-city neighborhoods, and in correctional facilities. The United States military successfully used telemedicine during the Gulf War and during the conflict in Somalia. At least 20 states have implemented telemedicine in some form.

The Georgia Statewide Academic and Medical System, GSAMS, is the world's largest and most comprehensive distance learning and health care network. The Georgia Department of Administrative Services operates a communications network that can access cable systems, microwave systems, and satellite dishes. One aspect of the system is a telemedicine network that utilized fiber-optic cable to link a series of rural health care facilities with secondary and tertiary care centers in a "hub and spoke" configuration. As telemedicine has become more specialized and technologically dependent, health care providers and equipment have become centralized in urban areas. Rural providers and facilities have had to depend on their own scarce resources, or have had to arrange for patients to travel to urban areas for specialized medical consultation. Rural physicians encounter professional isolation and lack resources that are readily available in urban areas. Telemedicine offers one part of the solution to these problems.

TheTelemedicine Center of the Medical College of Georgia began in November 1991 with a single remote site at Dodge County Hospital in Eastman, Georgia. It has grown steadily over the past three years. The six current remote sites consist of two rural hospitals, two correctional institutions, one Public Health Facility, and an Ambulance Care Center. Early in 1995, Georgia will have 59 fully operational telemedicine sites, enabling patients to remain in their own communities while receiving specialized medical consultation through a two-way, interactive audiovisual link.

Since its implementation, the telemedicine program has demonstrated success by preventing the unnecessary "shipping out" of patients to tertiary medical centers for specialty or subspecialty medical consultation. By the end of October 1994, more than 355 telemedicine consultations had been completed by MCG specialists for patients who were referred by physicians at remote sites. Approximately 86% of the patients seen via telemedicine were retained in their own communities and did not have to be transferred to the tertiary care center for specialty consultation.

Recent advances in electronics have not only made telemedicine possible, but also affordable. Most of the components utilized in telemedicine are "off the shelf" components, and none of the components require a high degree of technological expertise to operate. On the other hand, the communications linkages require a different level of sophistication in their development and deployment. The Georgia Telemedicine Program uses fiber optic communications; other communication linkages include satellite and microwave technology. The integration of "off the shelf" technology with a highly sophisticated infrastructure calls for the development of partnerships between the medical provider, MCG, state government, and private communications companies.

The basic equipment of the GSAMS Telemedicine Network includes: TV monitors, an interview camera, examination camera, microcamera, document camera, system controller, medical instruments, and camera adapters, VCR, and the code for digital compression and decompression of the audiovisual signal. The equipment is integrated through the system controller, a series of touch screen panels used to select and operate the camera, VCR, audio, and preview and transmit functions. A personal computer integrated into the system provides a patient database; capturing of images transmitted at 30 frames per second, as well as transfer, annotation, archiving, and retrieval of those images; and Scientific American's Medicine Consult Service, a medical reference database resource. A dedicated, full T1 fiber optic cable provides the "pipeline" for transmission of information and data across long distances.

The most critical components of the telemedicine system are the end users — the health care providers and patients. People, not technology, determine the operational aspects of the system. The Georgia Statewide Telemedicine System became a reality through the partnering efforts of state government, business, the rural community, and the academic community.

THE GOAL OF TELEMEDICINE

The goal of the Georgia Telemedicine system has been described as follows: "To assure that everyone in the state, whether living in the heart of Atlanta or on a south Georgia farm, has immediate access to quality medical care." While the most immediate purpose of the system is to reach this goal, the promotion of health and well-being of all Georgia's citizens is also a part

of telemedicine's purpose.

While the goal and purpose of telemedicine appear to be noble, the functional aspect of telemedicine must be able to meet the goal at a reasonable cost, with reasonable reliability, and without undue hardship to providers and patient. These aspects can only be accomplished with some modifications to the practice of medicine, which include the operation and acceptance of medical instruments modified for telemedicine usage, learning additional communication methods (e.g. videoconferencing), adding telemedicine to the list of health care service options, and recognizing that telemedicine can be used to enhance medical knowledge to all health care providers, and to improve technical expertise in operating medical equipment (such as ultrasound and echocardiogram).

If telemedicine is to be successful and play a significant role in health care reform, there are many issues to be resolved. Licensure, malpractice reform, confidentiality, and the development of electronic records are some of these. Investment costs in technology and "human factors" related to the use of telemedicine by providers, patients, and referral sources are other issues to be resolved. Credentialling is one issue yet to be resolved. Patients who are seen by a specialist consultant at the tertiary care site remain in the care of the referring physician in the remote site. The referring provider seeks the advice of the consultant, but the actual orders are written by the physician who referred the patient. This also helps to provide for continuity of care.

In the current state-by-state system of licensure, it appears that a health care provider would need to be licensed in each state in which telemedical service is to be provided. Because of the expense of time and money, it is likely that providers would not pursue licensure in several states. This would have the effect of limiting severely the networking capability offered by the telecommunication system. There are a number of potential solutions to this problem of licensure. Simplest would be for all parties to agree that the patient is being transported (electronically) to the state in which the provider is licensed. An alternative solution has already been developed by federal practitioners in that the providers are certified at the national level and are not subject to the jurisdictional boundaries of states or provinces.

Malpractice liability has yet to be tested as there have not been any malpractice suits filed related to telemedicine initiatives. As the dollar figure associated with telemedicine grows, however, it is likely that there will be a shift in focus by the legal profession. Digital compression also presents an issue in that this process requires that images change as they are compressed (through the deletion of redundant images). The data that is being seen following transmission is "incomplete," as it has been altered in the process of compression.

On the positive side of the malpractice issue, the audiovisual videotaping of the entire consultation exchange completely avoids the common problem of lack of documentation. It also allows the referring provider and/or consultant to review the actual images as many times as needed and whenever convenient. These points are relevant with regard to the development and finalization of medical records as well. However, a new set of problems may emerge as a huge amount of information will need to be recorded, edited, and archived without deleting important data.

RECENT ADVANCES IN ELECTRONICS HAVE NOT ONLY MADE TELEMEDICINE POSSIBLE, BUT ALSO AFFORDABLE.

Finally, confidentiality continues to be an issue as the transmission of sensitive, personally identifiable information is vulnerable to electronic intrusion and exposure. Messages will need to be encrypted, but even the best codes "were meant to be broken." It is highly likely that technological advances in record keeping will help to resolve much of this issue.

THE EFFECTS OF TELEMEDICINE

Access to care and assurance of quality at a reasonable cost underline the major inequities of the present health care system in the United States. This country has been a leader in the development and use of information and telecommunication technologies. As this expertise is applied to healthcare, it is likely that telemedicine and related technology will continue to grow and will become commonplace in the healthcare delivery system.

As early as 1975, authors expressed the need for research on telemedicine. While a number of clinical issues need to be clarified with regard to telemedicine, there are also a number of health services research questions that must be explored. These areas include health care accessibility, quality, cost effectiveness, and benefit. In fairness, however, it should be recognized that many questions related to accessibility, quality, and cost effectiveness have not yet been answered with regard to our traditional medical service delivery systems.

Other areas for research include issues of the reliability of diagnosis via telemedicine versus "in person." A preliminary study at the Medical College of Georgia suggests that there is a high degree of reliability in telemedicine dermatology consultation. Of 22 cases that were evaluated by telemedicine and by direct examination, there was 100% agreement of the telemedicine diagnoses with the direct examination diagnoses. The use of telemedicine in health promotion, wellness, and prevention will also need to be examined through the research lens.

THE FUTURE OF TELEMEDICINE

It is anticipated that the same communication capability that will allow the entertainment industry to interact with an individual at home or at work will also allow a patient and his or her physician to do the same. In fact, with existing technology, it is possible for the physician to examine his patient at home affording ease of access and immediacy of care. Soon, physicians will have desktop telemedicine systems that are linked with electronic patient records, treatment protocol databases, practice guidelines, and other medical information. Early recognition and institution of therapy should impact dramatically on disease severity and health care costs.

In the 1990s, we will finally achieve what was science fiction in the 1920s. ■

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Telemedicine Expands

THE MEDICAL COLLEGE OF GEORGIA TELEMEDICINE Center has established a statewide network linking 59 health-care and correctional facilities that maximizes the care each facility offers as it reduces costs and improves convenience for patients.

That same network is being used by the federal Health Care Financing Administration to develop standards for this evolving mode of health-care delivery and as a role model for other states and countries working on similar systems.

Also, telemedicine has literally laid the groundwork for sweeping changes in education that could put doctors and other health-care providers in the classroom to teach children about staying healthy and enable Georgia's health-care providers to tap into a system that keeps them abreast of changes in their dynamic fields without leaving home.

These rapid strides toward addressing the complex issues of improving health care in rural America and reducing health-care costs fit hand-in-glove with MCG's role as Georgia's health science university, said Dr. Francis J. Tedesco, MCG president and the man who brought the concept to the Augusta campus.

His original plans have nearly been met for the system that uses a grouping of telephone lines and other off-the-shelf technology to enable long-distance patient examination.

With telemedicine, a doctor at a hub site, such as MCG Hospital, can work with a doctor in another city, helping examine a patient—looking inside his eyes and ears, listening to his heart, peering into his gastrointestinal tract—seeing essentially what the patient's own doctor sees.

"I wanted to network the entire state to elevate the ability for patients to get a higher level of consultative care through their primary care-giver without having to travel great distances," Dr. Tedesco said.

The program began in November 1991 with a 130-mile hook-up between MCG Hospital and Clinics and Dodge County Hospital in Eastman, Ga.

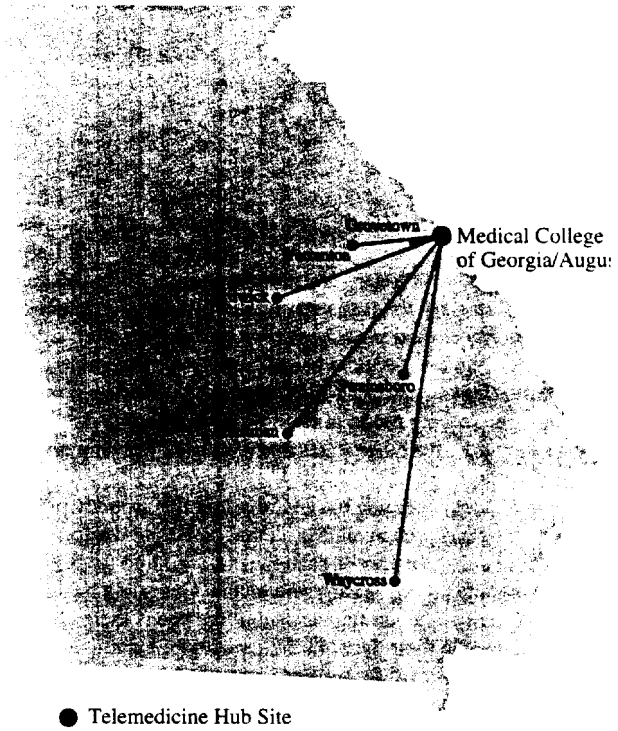
Today, telemedicine is a 59-member network of hospitals (including the two tertiary-care academic facilities of MCG Hospital and Emory University Hospital), outpatient clinics and maximum security prisons, sharing the talents of their health-care providers.

Experience with the Dodge County remote has shown 85 percent of the consultations enable patients to receive definitive care at home without having to travel by car or ambulance to some other city and hospital.

"It fits in perfectly with MCG's commitment to enhancing primary care-givers and with, long-term, what the federal government wants to do," Dr. Tedesco said. "The government is saying we need to create more generalists, less specialists. Telemedicine allows you to have more generalists and for them to feel more comfortable because they can be hooked up with specialists, but remotely," he said.

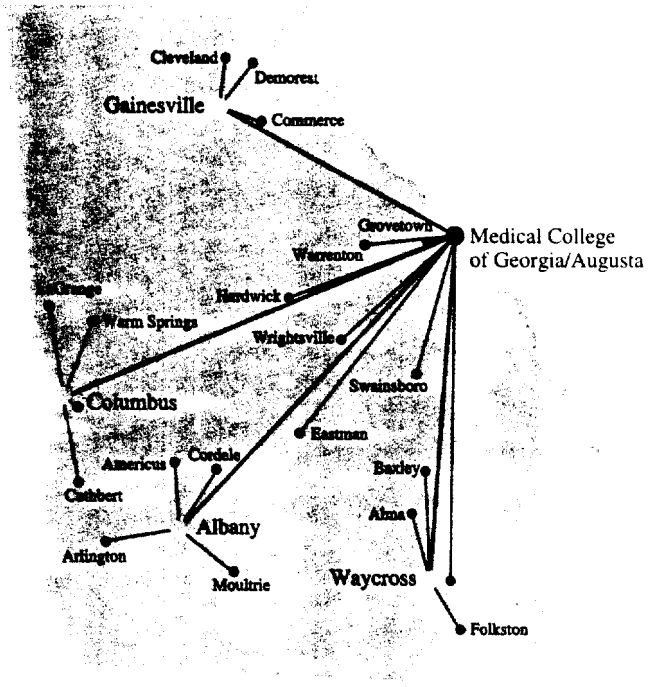
"What we have found with Dodge is very clear: the pri-

Telemedicine Pilot Project Locations



● Telemedicine Hub Site
• Telemedicine Remote Site

GSAMS Telemedicine Locations (Phase I)



● Telemedicine Tertiary Hub Site
Telemedicine Secondary Hub Site
• Telemedicine Remote Site

Georgia Statewide Academic and Medical System Locations

● **Medical College of Georgia, *Augusta***
- Augusta Correctional and Medical Institution, *Grovetown*
- Community Health Center, *Wrightsville*
- Dodge County Hospital, *Eastman*
- Emanuel County Hospital, *Swainsboro*
- Reidsville State Prison, *Reidsville*
- Georgia Diagnostic and Classification Center, *Jackson, Mobile*
- Men's Correctional Institution, *Hardwick*
- Metro Correctional Institution for Women, *Atlanta, Mobile*
- Tri-County Health Systems, Inc., *Warrenton*
- Rutledge Correctional Institution, *Columbus, Mobile*
- Southeast Health Unit, *Waycross*
- Valdosta Correctional Institute, *Valdosta, Mobile*
- Wills Memorial Hospital, *Washington*
- Phoebe Putney Memorial Hospital Nursery, *Albany*

● **Emory University Hospital, *Atlanta***
- Rockdale Hospital, *Conyers*
- Southern Regional Medical Center, *Riverdale*
- Tanner Medical Center, *Carrollton*

Columbus Regional Healthcare System, Inc., *Columbus*
- Meriwether Regional Hospital, *Warm Springs*
- Muscogee County Jail, *Columbus*
- Patterson Hospital, *Cuthbert*
- West Georgia Medical Center, *LaGrange*

Floyd Medical Center, *Rome*
- Chatooga County Hospital and Nursing Home, *Summerville*
- North Georgia Medical Association, *Taylorsville*
- Polk General Hospital, *Cedartown*

Hamilton Medical Center, Inc., *Dalton*
- Gordon Hospital, *Calhoun*
- North Georgia Family Physicians, *Ringgold*
- North Georgia Medical Center, *Ellijay*

John D. Archbold Memorial Hospital, *Thomasville*
- Brooks County Hospital, *Quitman*
- Grady General Hospital, *Cairo*
- Mitchell County Hospital, *Camilla*

Medical Center of Central Georgia, *Macon*
- Fairview Park Hospital, *Dublin*
- Houston Medical Center, *Warner Robins*
- Oconee Regional Medical Center, *Milledgeville*

Memorial Medical Center, Inc., *Savannah*
- Bulloch Memorial Hospital, *Statesboro*
- Liberty Memorial Hospital, *Hinesville*
- Wayne Memorial Hospital, *Jesup*

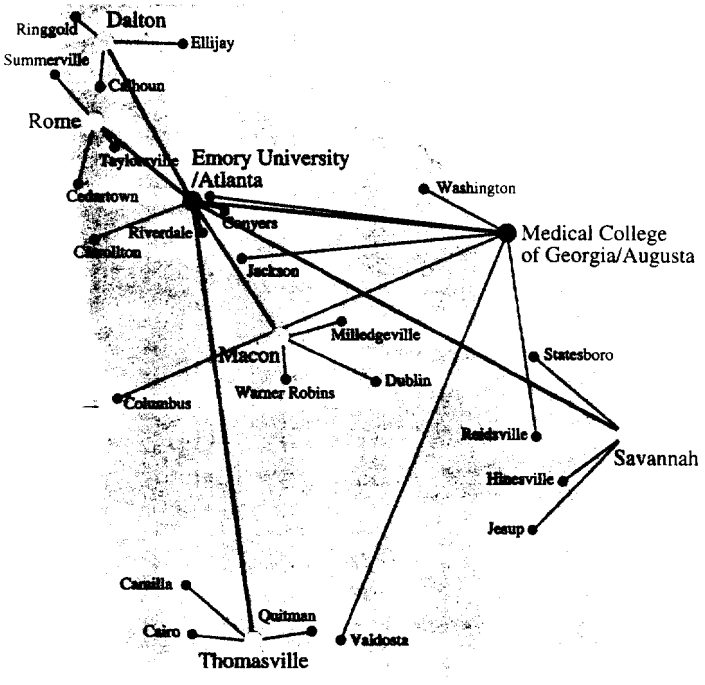
Northeast Georgia Medical Center, Inc., *Gainesville*
- Banks-Jackson-Commerce Medical Center, *Commerce*
- Habersham Medical Center, *Demorest*
- White County Neighborhood Healthcare Center, *Cleveland*

Phoebe Putney Memorial Hospital, *Albany*
- Calhoun Memorial Hospital, *Arlington*
- Colquitt Regional Medical Center, *Moultrie*
- Crisp Regional Hospital, *Cordele*
- Sumter Regional Hospital, *Americus*

Satilla Regional Medical Center, *Waycross*
- Appling General Hospital, *Baxley*
- Bacon County Hospital, *Alma*
- Charlton County Hospital, *Folkston*
- Clinch County Hospital, *Homerville*

● **Telemedicine Tertiary Hub Site**
Telemedicine Secondary Hub Site
• Telemedicine Remote Site

GSAMS Telemedicine Locations (Phase II)



● Telemedicine Tertiary Hub Site
Telemedicine Secondary Hub Site
• Telemedicine Remote Site

Left to right: Dr. Francis J. Tedesco, Laura Adams, Drs. Jay H. Sanders and Darrell G. Kirch

mary-care doctors in this rural community are actually expanding their practice because they are willing to take on more complex cases knowing that they have specialists who will be electronically giving them support." Dr. Tedesco said. "That was the concept in developing this."

Other concepts being developed include:

- Telemedicine house calls made possible by the same lines that bring cable television into the home. This allows patients with chronic health problems such as congestive heart failure or severe asthma to see health-care providers daily to ward off complications and avoid costly hospitalization.
- A system for nursing homes that allows daily monitoring of this at-risk population, again to nip a mounting health-care problem in the bud.
- A networking of hospitals providing extensive services for children. As a test site, the MCG Children's Medical Center has established a link with the neonatal intensive-care nursery at Phoebe Putney Memorial Hospital in Albany that enables pediatric cardiologists in Augusta to assess babies with potential heart problems in Albany.
- A networking of Georgia's public mental-health hospitals and community centers that would permit each to develop areas of expertise in the field and to share those skills.
- A networking of Georgia's prisons with the prison hospital, Augusta Correctional and Medical Institute, and with other hospitals as needed, to provide definitive care to prisoners without the safety risk and cost of transporting them.

"We are not only the most comprehensive statewide telemedicine system in the country from the standpoint of the number of sites, we are the most comprehensive from the various types of patient populations that we are dealing with," said Dr. Jay H. Sanders, the center's director.

"Health care suffers when it's isolated, when it's out of the mainstream of new knowledge, when it doesn't have access to special expertise in those cases where you need it," said Dr. Darrell G. Kirch, dean of the MCG School of Medicine. "This is just using the technology to fill those gaps. This is the information and electronic age yielding benefit for health care."

A common thread for these initiatives is to offer health-care services, and now health-care education as well, in the most timely and cost-efficient manner.

A Health Care Financing Administration grant will test the strength of that thread by providing the country with the first objective measure of telemedicine's impact on the accessibility, quality and cost of health care. Under terms of the $1.3 million dollar grant, the MCG Telemedicine Center will work with evaluators at the University of Michigan to examine the various aspects of this burgeoning approach to providing health care. Information gathered will be used by the Health Care Financing Administration in its evaluation of other states' telemedicine programs and in determining reimbursement for health-care services provided by those systems, Dr. Sanders said.

"In a few years, everybody will be doing telemedicine," Dr. Kirch said. "As an academic medical center, our mission now is evolving so that, just as we have been the leader in setting up a prototype network, we will now be leaders in research on the uses of the technology. In which cases is

it most effective in delivering care? Where does it save costs? Where might it end up increasing costs? How do patients respond? How do providers respond when asked to use it?"

All the activity in telemedicine also has spurred interest in distance learning. Southern Bell, in consultation with MCG and the state Department of Administrative Services, has networked an extensive system of telephone lines called Georgia Statewide Academic and Medical System, which will allow all telemedicine sites to communicate with each other and with distance-learning sites, Georgia's high schools, colleges, universities and select hospitals.

"(MCG faculty) can do site presentations. They can use overheads. They can present patients and do grand rounds (via) telemedicine," said Laura Adams, director of operations for the MCG Telemedicine Center. "You are not limited to another telemedicine site that can only hold 10 people. You can go to distance-learning sites in an area where all the hospitals and health clinics have been able to bring all of their physicians and other health-care providers into an auditorium to receive this information."

In fact, MCG's second telemedicine hub was designed with teaching in mind; the hub is a room in the hospital's Ambulatory Care Center with ample space for more than one doctor and a patient.

"The potential of this is enormous," Dr. Tedesco said. "What we are talking about is education without walls. It's possible that we can extend our educational capabilities to the citizens of Georgia without having to build buildings in every location, without having to hire teachers in every location. I think we have the ability to maximize health sciences education around the state in a way that young people in certain areas can get their education while residing in their communities and using the clinical training in their communities."

Funding to support the major telemedicine expansion and for distance learning initiatives comes from Georgia Senate Bill 144, The Distance Learning and Telemedicine Act of 1992, that makes $50 million available, approximately $40 million for distance learning and $10 million for telemedicine.

Dollars earmarked for telemedicine helped provide equipment upgrades for Georgia's existing telemedicine locations and for the original equipment and installation for newer sites, Mrs. Adams said. The funds also will pay half the monthly fees for transmission and equipment maintenance for the first two years for all telemedicine sites.

"Quite candidly, this would not have happened without the commitment and funding from the state," Dr. Sanders said. The technology has existed for years. "What made it happen was the fact that the state believed in it, the state said, 'Let's try it,' and then backed that with the appropriate funding and the commitment on the part of people." The state Department of Administrative Services and Southern Bell have been key players, he said.

"Medical care in this country is episodic, it's irregular," Dr. Sanders said. "It occurs at the wrong time. It waits until the patient gets sick rather than preventing the illness. When you realize that so many of the illnesses that we deal with in the elderly are illnesses that began when these people were very young, you begin to get a feel for how significant an impact we could make if we started at the right time. Telemedicine helps facilitate that. I think it will provide an incredible cost benefit to our society." ■

—TONI BAKER

Tele
conference
The Business Communications Magazine
Vol. 14, No. 1 1995

The Impact of Telemedicine: the Georgia Experience

By Jay Sanders, Laura Adams,
and Kevin Grigsby
Medical College of Georgia

The Impact of The Georgia Experience

by Jay Sanders, Laura Adams and Kevin Grigsby
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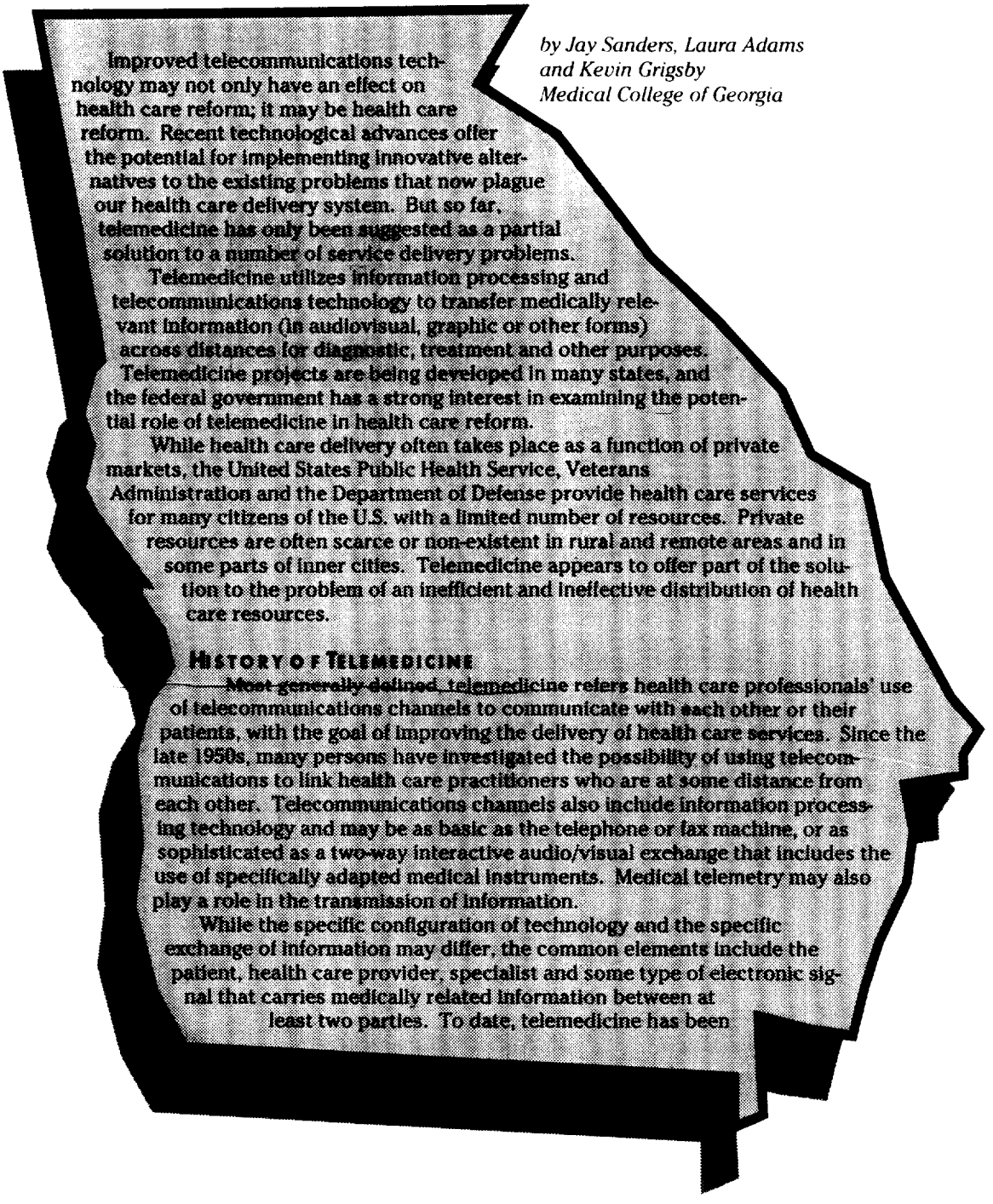


Improved telecommunications technology may not only have an effect on health care reform; it may be health care reform. Recent technological advances offer the potential for implementing innovative alternatives to the existing problems that now plague our health care delivery system. But so far, telemedicine has only been suggested as a partial solution to a number of service delivery problems.

Telemedicine utilizes information processing and telecommunications technology to transfer medically relevant information (in audiovisual, graphic or other forms) across distances for diagnostic, treatment and other purposes. Telemedicine projects are being developed in many states, and the federal government has a strong interest in examining the potential role of telemedicine in health care reform.

While health care delivery often takes place as a function of private markets, the United States Public Health Service, Veterans Administration and the Department of Defense provide health care services for many citizens of the U.S. with a limited number of resources. Private resources are often scarce or non-existent in rural and remote areas and in some parts of inner cities. Telemedicine appears to offer part of the solution to the problem of an inefficient and ineffective distribution of health care resources.

History of Telemedicine

Most generally defined, telemedicine refers health care professionals' use of telecommunications channels to communicate with each other or their patients, with the goal of improving the delivery of health care services. Since the late 1950s, many persons have investigated the possibility of using telecommunications to link health care practitioners who are at some distance from each other. Telecommunications channels also include information processing technology and may be as basic as the telephone or fax machine, or as sophisticated as a two-way interactive audio/visual exchange that includes the use of specifically adapted medical instruments. Medical telemetry may also play a role in the transmission of information.

While the specific configuration of technology and the specific exchange of information may differ, the common elements include the patient, health care provider, specialist and some type of electronic signal that carries medically related information between at least two parties. To date, telemedicine has been

Telemedicine:

used in psychiatry, ophthalmology, radiology and other medical specialties in rural areas, the inner city and correctional facilities. Military applications have been developed and were used successfully during the Gulf War.

Telemedical consultation has become more widely available in recent years as improvements in technology have allowed for less costly, higher quality information processing and transmission. In a 1993 article to Am Medical News, R. Gariess reported at least 20 states have implemented some type of telemedicine project.

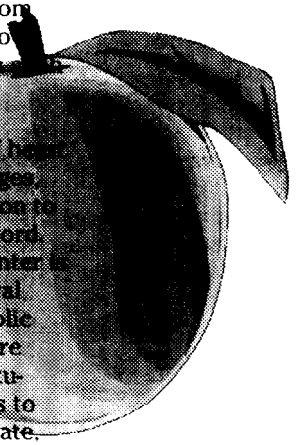
Telemedicine in Georgia

GSAMS, the Georgia Statewide Academic and Medical System, is the world's largest and most comprehensive distance learning and health care network. The Georgia Department of Administrative Services operates a communications network that can access cable systems, microwave systems and satellite dishes. A major portion of this system is a telemedicine network that utilizes fiber optic cable to link a series of sites with secondary and tertiary care centers in a hub and spoke configuration.

As medicine has become more specialized and technologically dependent, health care providers and equipment have become centralized in urban areas. Rural providers and facilities have had to depend on their own scarce resources or have had to arrange for patients to travel to urban areas for specialized medical consultation. Rural physicians encounter professional isolation and lack resources that are readily available in urban areas. The Georgia telemedicine system has been developed as one part of the solution to these problems.

The Medical College of Georgia (MCG) Telemedicine Center began in 1991 with a single remote site at Dodge County Hospital in Eastman, Ga. and has grown steadily over the last three years. Implementation of a statewide telemedicine expansion, which will add 52 sites, began in October 1994. By the first quarter of 1995, the state of Georgia will have 59 fully operational telemedicine sites enabling patients to remain in their own communities while receiving specialized medical consultation through a two-way, interactive audiovisual link.*

This expansion was funded by the Distance Learning and Telemedicine Act of 1992, which provided $8 million to the expansion of telemedicine and $42 million to the initiation and expansion of distance learning. The statewide telemedicine system will be comprised of two tertiary care centers (MCG and Emory University), nine comprehensive secondary care centers and 41 remote sites. This makes the system the most comprehensive of its kind in the nation; providing the capability of specialists to perform a full range of health care services from simple physical examinations to complex diagnostic procedures such as echocardiograms and endoscopies. The patient database allows the storage and recall of heart and lung sounds, captured images, annotation and other information to be included in the patient's record.



The MCG Telemedicine Center is linked to rural hospitals, medical centers, physicians offices, public health facilities, ambulatory care facilities and correctional institutions. The goal of the system is to "assure that everyone in our state, whether living in the heart of Atlanta or on a south Georgia farm, has immediate access to quality medical care." (Jay Sanders and F.J. Tedesco. (1993). Bringing Medical Care to Isolated Communities, Journal of the Medical Association of Georgia, vol. 82, pp. 237-241.) For the health care practitioner, immedi-

ate access is quickly becoming less and less sensitive.

Positive Results

Over 355 telemedicine consultations have been completed at MCG during the 1991-1994 time period. Approximately 86 percent of the patients seen via telemedicine were retained in their own communities and did not have to be transferred to the tertiary care center for specialty consultation. (Sanders, J.H., Grigsby, R.K., and Adams, L.N. (1993). Telemedicine: An Informational Review for the Federal Practitioner. Federal Practitioner. Submitted for review.)

This represents a number of positive factors:

1. Patients did not experience the delay that is usually involved in scheduling a specialty consultation at a tertiary care site.

2. Patients did not have to travel to a tertiary care center. Georgia is the largest state east of the Mississippi River and is largely rural. Even with the interstate highway system, it is not unusual for patients to travel three to four hours in order to participate in a specialty consultation at a tertiary care center. Public transportation is almost nonexistent outside of the urban areas. The cost of private air travel is prohibitive. In many cases, patients and family members must also spend the night in a local motel. In fact, the MCG Hospital and Clinics site is surrounded by motels advertising direct phone service to the hospital.

3. Local hospitals and care providers are able to retain patients within the local community. Rural hospitals are often troubled by the problem of low or declining census. By keeping patients in local beds, rural hospitals are able to keep the income that would otherwise be lost to the tertiary care center. One criticism that has been levied against the MCG is that there is the desire to use telemedicine to recruit patients from rural areas. The findings of the last three years indicate that the converse is true: telemedicine has actually helped communities and providers to retain patients. It is true that 14 percent of the patients are still referred on to the tertiary care center, but the great majority are not.

4. Via telemedicine, medical practitioners have timely access to medical consultants on a face-to-face basis. This allows for real time learning from the consultant by the referring clinician. In fact, MCG is able to provide Category I continuing medical education (CME) credits to referring physicians who participate in the consultation process.

5. Primary care physicians are able to treat their patients longer, a result of both additional knowledge gained through use of the telemedicine system (greater access to specialists), and providing care recommended by the specialist during a telemedicine consultation. Even when referral is necessary, telemedicine facilitates the involvement of the primary care physician for follow-up care, and improves the flow of information regarding diagnosis and treatment. Specialists are able to involve the patient's primary care physician in all aspects of the patient's care regimen.

6. The quality of care is maintained or improved. A preliminary study at the MCG suggests that there is a high degree of reliability in telemedicine dermatology consultation. Of 22 cases that were evaluated by telemedicine and by direct examination, there was 100 percent agreement of the telemedicine diagnoses with the direct examination diagnoses. Other research is likely to confirm the diagnostic reliability of telemedicine across many disciplines.

7. Telemedical consultation is recorded in videotape, allowing referring practitioners, consultants and others to review the entire consultation as many times as necessary. This also offers a legal advantage in that the problem of lack of documentation can be avoided. The development of an electronic medical record will permit the capturing of images from the telemedical consultation for direct entry into the medical record. This may include graphic, aural or visual recording. These videotapes are also used for risk management and quality assurance purposes and are reviewed by the CME evaluation committee.

Creating a Success Story

While there is not yet enough data to declare that telemedicine in Georgia is a universal success, there are many reasons to believe that the efforts to date are the first chapter in a success story that will have many more chapters. Telemedicine is relatively new however, therefore, continued evaluation, research and time are needed in order to clearly demonstrate the advantages and disadvantages the Georgia telemedicine system. ■

Dr. Jay Sanders is director of the Telemedicine Center, a professor of medicine and surgery, and holds the Eminent Scholar chair in telemedicine at the MCG. He has been involved in the development of interactive telecommunications in health care for more than 27 years. Laura Adams is the director of operations at the telemedicine center, and Kevin Grigsby is the director of research and is a professor and director of social psychiatry at MCG.

* NOTE: Due to implementation modifications, the installation schedule has been reduced. As of July 7, 1995, 34 sites are operational, with remaining installations scheduled to be completed by December, 1995.

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The Georgia State Telemedicine Program: Initiation, Design, and Plans

LAURA N. ADAMS and R. KEVIN GRIGSBY, DSW

ABSTRACT

This paper describes the genesis, implementation, and operation of the Georgia Statewide Telemedicine Program, a full-service system that provides a comprehensive range of clinical and consultative services to all residents of the state through a hub-and-spoke network. When completed, it will consist of several tertiary-care centers and a set of secondary hubs at medical centers throughout the state. Each hub will, in turn, serve several remote sites. The system enables connectivity throughout the network, and the overall coordination, implementation, and oversight is provided by the Center for Telemedicine at the Medical College of Georgia. The evolution of the system is described, together with lessons learned from the experience.

INTRODUCTION

THIS PAPER DESCRIBES THE INITIATION, implementation, design, and plans of the Georgia Statewide Telemedicine Program (GSTP). It is presented as a case study of a model statewide network, now in its third year of operation. The network evolved as the culmination of concerted efforts on the part of state government, academia, and private industry. When fully implemented in 1996, GSTP will constitute a full-service, full-time consultative and referral telemedicine system serving the entire state of Georgia through a hub-and-spoke network. Patients and providers will be able to interact and exchange clinical information and consultation throughout the state without having to leave their home communities. A case description of the genesis and evolution of this system, the planning and implementation process, as well as its design configuration may be helpful to other states contemplating the development of such statewide networks.

THE GEORGIA CONTEXT

Before describing the genesis and evolution of the GSTP, a word of explanation regarding the impetus for the development of this system is in order. The primary impetus was the convergence of views among major stakeholders in the state of Georgia regarding intractable problems in health care delivery and the appropriateness of telemedicine to address these problems. At both state and national levels, policy makers, academics, and private industry have been struggling with problems of escalating health care costs and limited accessibility among segments in the population. Georgia's experience is typical of states with large rural populations. The convergence of views regarding the importance of the

Medical College of Georgia Telemedicine Center, Augusta, GA

statewide network reflected a shared recognition of the existence of serious deficits in the provision of health services to the people of Georgia. When telemedicine was suggested as a versatile, multifaceted, and low-cost solution, it was embraced by all of these groups.

As in many other states that are largely rural, accessibility to appropriate medical care in certain areas and communities of Georgia is rather limited. Indeed, in some places, the geographic, economic, and cultural barriers to such care are formidable. For instance, 11 of Georgia's 159 counties had no practicing physicians in 1992,[1] and fewer than 50% of the counties had a pediatrician (RK Grigsby, unpublished data). Moreover, many counties did not have subspecialists of any kind. In the mental health area, for example, only 12% of the counties had a practicing child psychiatrist. Of the 73 child psychiatrists in the state, 43 were clustered in the metropolitan Atlanta area, leaving only 30 for the remainder of the state.[2] Thus, as with many patients in rural Georgia requiring various kinds of subspecialty care, substantial numbers of children requiring psychiatric services would either have to travel long distances to the nearest facility or forego the care.

The search for systemic solutions to the problems assumed different forms, including both private and public as well as public–private forums. Ultimately, a public–private consensus emerged to incorporate the telemedicine solution into the broader scheme of constructing the state's telecommunications infrastructure and an extensive plan to enhance economic development within the state. The partnership was propelled into action by the confluence of opportune circumstances that presented themselves in a charged political environment, as will be explained later. These circumstances were complemented by advances in enabling telecommunications and computer technologies.

PROGRAM GENESIS AND EVOLUTION

The genesis of the GSTP can be traced to three separate sources: state government (both executive and legislative branches and the Department of Administrative Services [DOAS]), academic institutions (primarily the Medical College of Georgia [MCG]), and private industry (particularly public utilities). Each of these sources played a pivotal role within its respective domain that proved critical to the creation of the system. Without their combined interests and perspectives, it is doubtful that a system of this scope and scale would have been possible. Funding for the massive effort became available in an opportune fashion, which may or may not be replicated elsewhere.

The Role of the State

The unexpected availability of financial resources under state control played a significant role in expediting the development of the GSTP. In 1989, the Public Service Commission ruled that Southern Bell had accumulated $140 million in "over earnings." Approximately $70 million was returned to the state's citizens via a monthly telephone bill credit ($1.50 per household per month for approximately 18 months), and the balance was placed in a state Economic Development Fund. A group including representatives from the Georgia DOAS, the Public Service Commission, and the state legislature developed the idea of a statewide distance education and telemedicine network.

A series of public hearings was held to solicit ideas and proposals concerning the implementation of such a network. These hearings produced two major proposals. The MCG proposed establishing a statewide telemedicine network, and several groups, including the Georgia Department of Education, the Board of Regents for the University System of Georgia, and others, proposed the development of a statewide distance learning network. The combined network was envisioned as greatly improving access to education and health care throughout the state. The proposals were subsequently enacted into law with the passage of Senate Bill (SB) 144, The Georgia Distance Learning and Telemedicine Act of 1992, which was signed by the governor on March 20, 1992.

The DOAS was assigned responsibility for coordinating activities leading to the development of a statewide distance learning and

telemedicine network. Additionally, the law (SB 144) created the Distance Learning and Telemedicine Network Governing Board and charged it with responsibility for developing an overall implementation strategy and for making resource allocation decisions on how the money is spent. The Board was organized into four standing committees to administer the distribution of funds in four domains: (1) academic programs; (2) technology; (3) administration; and (4) telemedicine. Finally, an advisory Telemedicine Task Force was created within the Telemedicine Committee and charged with responsibility for reviewing proposals and making recommendations for funding to the Telemedicine Committee. In time, this Task Force emerged as the most active unit guiding the planning and deployment of telemedicine in Georgia.

Fifty million dollars was initially released by the Governing Board, and the remainder was held in escrow. In July 1995, the Board approved additional expenditures of approximately $18 million. The telemedicine share of the initial $50 million allocation was relatively small. To date, a total of approximately $9 million has been allocated by the Board of Governors for the deployment of the statewide telemedicine program—$8 million from the initial allocation and $1,080,000 from the second allocation. Approximately $59 million was spent on distance learning and various other related projects, including cable for interactive videoconferencing, satellite technology, Internet access for 13 regional libraries, and programming funds for Georgia Public Television.

The Role of the Medical College of Georgia

The MCG was instrumental in providing the necessary information about the nature of health care needs in the state and how telemedicine might provide a partial solution to the longstanding problem of maldistribution of health care resources between urban and rural Georgia. Interest in telemedicine was sparked at the highest level within the institution. In 1989, well before the establishment of the Economic Development Fund, the President of MCG, together with representatives from the Office of the Governor, the state's Office of Rural Health, and the Georgia legislature, visited the telemedicine system at the University of Miami. The group came back with the determination to launch a pilot telemedicine project, with MCG as a testbed, in order to determine the feasibility and merit of telemedicine for Georgia.

The pilot project was started in November 1991, and it had the following specific objectives:

To demonstrate the capability of telemedicine in Georgia;
To determine the feasibility of telemedicine for the state of Georgia;
To demonstrate some of the basic benefits of telemedicine to the people of Georgia; and
To utilize the pilot demonstration for securing long-term support for telemedicine in the state.

Dodge County Hospital was selected as the remote site. It was connected to the MCG through a T1 telecommunications link utilizing interactive videoconferencing technology integrated with remote-controlled biomedical telemetry. BellSouth loaned the interactive video equipment, and MCG paid for the medical components and cabinetry from its own funds. In addition to the basic telemedicine equipment, a separate 1000 × 1000 resolution teleradiology system was purchased by MCG. The entire cost of the pilot testbed, including equipment, cabinetry, integration, training, and maintenance, was approximately $330,000. This configuration allowed a consulting physician at the tertiary-care center (MCG) to examine a patient in the remote site (Dodge County) much as if the patient and physician were in the same room.

In its pilot year, the telemedicine project conducted 180 clinical consultations, and some rudimentary data were collected to assess system performance and user acceptance. Participating physicians at the MCG (N = 29) and Dodge County Hospital (N = 6) were asked to complete pre-encounter and postencounter forms that queried them about their views and perceptions regarding their experience with telemedicine and its impact on their clinical practice.[3]

The principal findings from the survey were interpreted as providing ample justification for expanding the pilot into a much larger framework, and the political will in the state provided the necessary support for a statewide program. Some of these findings are presented here for their general interest.

Prior to their first experience, about two-thirds (65%) of the consulting physicians were either neutral or unfavorably disposed toward telemedicine. However, after their first experience, a considerable majority (78%) were either "satisfied" or "highly satisfied," and 56% reported that telemedicine consultations required the "same" or "less" time than in-person consultations. When asked about their inability to palpate patients, 70% said it was "not a serious problem." Eighty-five percent of the consulting physicians felt that the telemedicine system could improve care in rural hospitals.

The overall quality of the video as well as ease of use were rated as "good" or "excellent" by 77% of the respondents. Eighty-one percent characterized the audio quality as "good" or "excellent." Nearly half, or 48%, reported patient rapport to be "good" or "excellent," and three of four ranked the ability to communicate with patients as "good" or excellent." Consultants were more sanguine about communication with the referring physician than with patients: 92% reported it as "good" or "excellent." Nearly three-quarters, or 72%, rated the information received for making a diagnosis as "good" or "excellent," while 67% gave similar ratings for medication information. Eighty-eight percent felt that telemedicine improved collegiality between referring physician and consultant, and 80% believed that telemedicine was a useful tool for continuing medical education.

In October 1992, the Board of Regents approved the establishment of a Telemedicine Center at the MCG, and it assigned broad responsibilities to its director, including the management and expansion of telemedicine programs under its aegis. The scope of its activities included clinical consultations, research, biomedical engineering, and administration/operations.

The pilot project demonstrated that specialists at MCG were able to examine patients at the Dodge County Hospital who were referred by their physicians. In the past, virtually all of these patients would have had to travel to a secondary- or tertiary-care center in order to receive this type of specialty care or else forego the service entirely. After telemedicine was introduced, more than 80% of the telemedicine patients who required care were able to receive it at Dodge County Hospital and did not have to travel to the tertiary-care center. Although we cannot confirm that the change occurred as a direct result of telemedicine, savings of approximately $740 per day were realized for each inpatient who was admitted to or retained in the local hospital rather than being transferred to MCG. (This figure is the differential in the cost of hospitalization at the tertiary-care center—about $1,840—and Dodge County Hospital—about $1,100). Additionally, outpatients saved costs related to travel, time away from work, and out-of-pocket expenses.

Because of the positive experience with the pilot, the decision was made to expand the telemedicine system in Georgia. By December 1993, the MCG Telemedicine System had grown to seven sites (Fig. 1). Two county hospitals, one public health clinic, a rural clinic serving three counties, and two correctional facilities (see below) were linked to the tertiary-care facility at the MCG in Augusta. The Department of Corrections provided the necessary funds to implement a pilot test using correctional facilities, while grant money from the Georgia Department of Human Resources supported the expansion to the other sites. The BellSouth Foundation awarded a $150,000 grant to the Telemedicine Center in April 1992 to support physician training and other developmental activities, while the Georgia Power Foundation provided an additional $125,000 to sustain Telemedicine Center activities.

Department of Corrections

The Department of Corrections initiated its pilot test in June 1993 and reached similar conclusions suggesting the economic and clinical viability of telemedicine in the correctional setting. The initial two Department of Correction sites were located at the Augusta Correctional

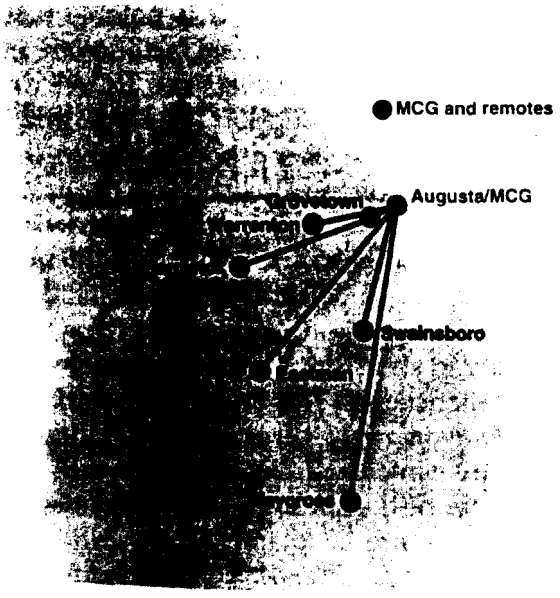

FIG. 1. Medical College of Georgia Telemedicine Center original seven sites deployed with first-generation technology.

and Medical Institute (ACMI) in Grovetown and the Men's Correctional Institute in Hardwick. The ACMI is a prison and a hospital and served as a secondary hub to the correctional institute in Hardwick. Telemedicine consultations with the MCG were obtained when the needs of the patient were beyond the scope of care provided at the ACMI.

IMPLEMENTATION PROCESS

Initial Steps

Development of the specifications for the statewide telemedicine network commenced in early 1993 and was carried out jointly by the MCG and the DOAS. These specifications covered a broad range of issues, including technical specifications for equipment, maintenance and training requirements, and operational procedures. The MCG Telemedicine Center was designated as the manager of the GSTP, but the bidding process for contractors was controlled by the DOAS General Services Division.

The first invitation to bid was issued in September 1993, and it included requirements for equipment purchase, system installation, diagnostics for complete system operation, technical and user training, and all maintenance and technical consultative services. The integrator was responsible for ensuring that the components would be integrated into an operational system according to explicit specifications. The bidding process occurred twice because of a vendor protest of the first bid award. Although this caused a delay in the expansion program, it resulted in a lower final bid system. The savings were used to purchase additional equipment to upgrade the clinical functionality at the secondary and tertiary hubs, enabling them to present patients as well as provide consultations.

Expanding the System

While the bidding process continued, identification of the expansion sites began. The first phase of the expansion (Fig. 2) included four secondary hubs located strategically around the state in Gainesville (north), Columbus (west), Albany (southwest), and Waycross (south). At MCG, a second base site was added in the Ambulatory Care Center to provide the initial tertiary hub for the new sites. The original seven sites were not interoperable with the

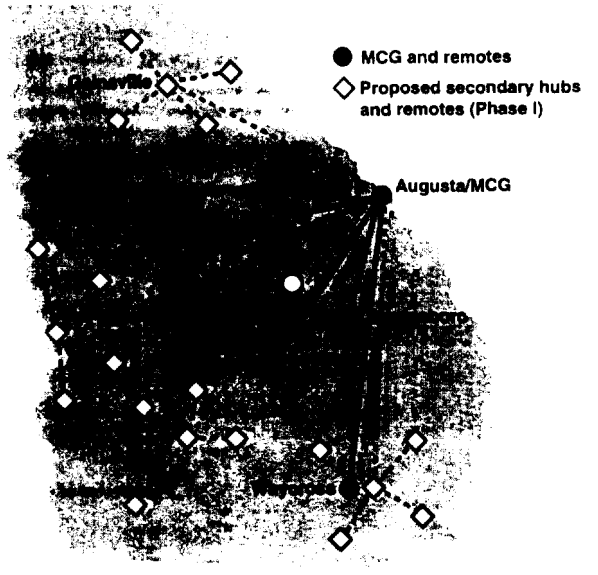

FIG. 2. First expansion phase including creation of secondary hubs with connected remote sites.

newer installations and cannot connect to the statewide network or any new sites before being upgraded. Therefore, the original site located in the emergency services area of MCG must be maintained until the conversion of all original remote sites is completed. Each of the secondary hubs in the first expansion phase was to be connected with three or four remote health care facilities in rural communities, which were selected on the basis of a short list of criteria.

An additional set of sites were proposed for a second expansion phase (Fig. 3). Five additional secondary hubs were approved in Dalton, Rome, Macon, Thomasville, and Savannah. A second tertiary-care hospital at Emory University in Atlanta was also approved for inclusion in the second expansion phase. Three remote locations are linked to each of the secondary hubs, thus creating a network of primary-care site to secondary-care hub to tertiary-care center. On the basis of its positive experience, the Department of Corrections also submitted a proposal to expand telemedicine services to the DOAS. This proposal outlined the expansion of five additional sites that would function in the same manner as the Men's Correctional Institute, namely, remote sites to the ACMI. Of the five expansion sites, Reidsville would be the only fixed one, while the institutions in Atlanta, Columbus, Jackson, and Valdosta would be served by a mobile telemedicine van. It is notable that all of the additional correctional facilities are maximum security institutions. The DOAS determined that it could support the Department of Corrections expansion proposal within the $9 million telemedicine allocation.

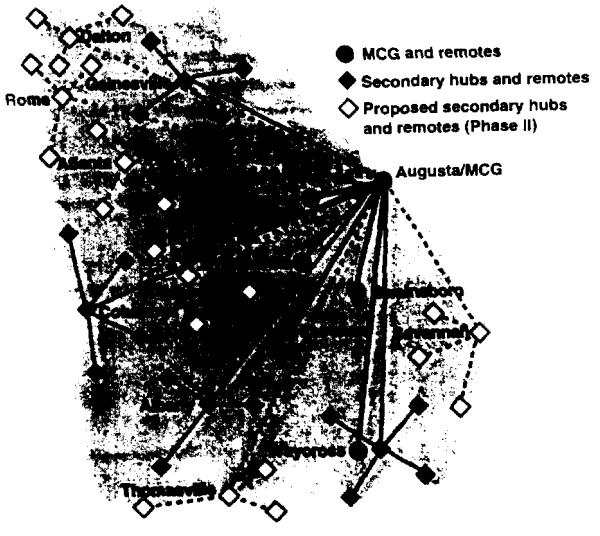

FIG. 3. Second expansion phase.

Additional expansion sites approved included a community center in Wrightsville, a rural hospital in Washington, a neonatal nursery in Albany, and a military tertiary hub in Augusta to serve the health care needs of military beneficiaries. The final configuration will include two tertiary-care centers, a military tertiary-care center and ten secondary hubs. The remainder of the sites are classified as remote. In all, there are 62 planned sites around the state of Georgia (Fig. 4). Ultimately, a hierarchical, regionalized telemedicine system is envisioned. This will ensure that appropriate medical expertise in each area is utilized before patients are referred to a specialty consultant outside the region. Local providers will determine when to use the expertise available at the tertiary-care site and when the patient will be seen by someone outside the region. This arrangement permits statewide coverage in a distributive fashion while avoiding unnecessary duplication. The ultimate goal is to establish an efficient and effective telemedicine delivery system to serve all citizens in the state of Georgia regardless of their geographic location.[4]

Because of the bid process delay, most of the original Phase I and Phase II sites had been identified prior to the bid award. As a result, only one implementation phase was actually initiated, although it was planned in two phases. Sites were scheduled for installation as they completed their site preparations (painting, wiring, lighting, ventilation, etc.).

The final step in the implementation process is to orient and educate the participants or users in all sites. A systematic educational program was implemented to ensure that sites had a realistic understanding, not only of telemedicine in general, but also of its specific requirements and the demands that will be imposed on them. Each proposed site was visited by a team including members from the Telemedicine Center and the DOAS, a BellSouth Building Inspection Code engineer, a techni-

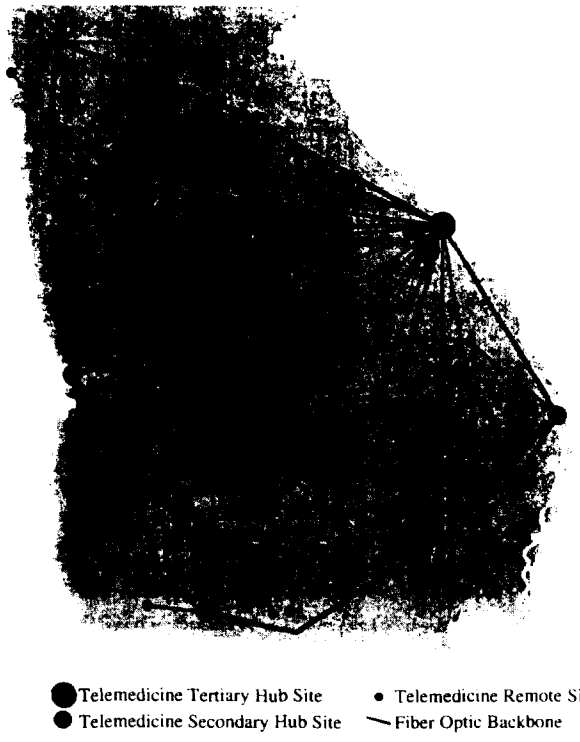

FIG. 4. Georgia Statewide Telemedicine Program that will include tertiary-care centers, secondary hubs, and remote sites. Sixty-two telemedicine sites are currently planned for this extensive hub-and-spoke network.

cian from the integrator, and local telephone representatives. Prior to the visit, facility administrators were provided with a list of site responsibilities and telemedicine room specifications. The meetings were attended by various members of the health care facility, including the administrator, medical director, chief nurse, continuing education director, plant engineer, financial administrator, and site coordinator. The basic items on the agenda included discussion of the statewide program, response to questions and concerns at the site, and finalizing plans for the telemedicine room. Within 3 weeks of the visit, each site was provided with an implementation and installation plan, which listed specific actions required before installation of the telemedicine system.

LESSONS LEARNED

Communications network boundaries are problematic. Local access transport areas (LATAs) are artificial boundaries that telecommunications companies use to set fees. Any time a boundary is crossed, an interexchange carrier (e.g., Sprint, AT&T, or MCI) must be used, and long distance charges are assessed. This usually is billed on a monthly basis, and most consumers actually pay a portion of these costs when they pay their monthly phone bill. Interexchange carrier costs also apply to interactive networks such as telemedicine. The DOAS implemented an innovative telecommunications network that supports both the telemedicine network and the distance learning network at a flat rate per site. The network provides a private T1 network for telemedicine sites and a private 1/2 T1 (768 kbps) network for distance learning sites. The intra-LATA component is provided by Southern Bell and 33 independent telephone companies throughout the state. Separately, the DOAS contracts with both Sprint and AT&T for inter-LATA circuits. The network is structured to support both vertical and horizontal connection (remote-to-remote site, remote-to-hub site, or hub-to-hub site), as well as interconnectivity between all 62 telemedicine and 375 planned distance learning sites. The DOAS also negotiated a flat-rate fee structure with BellSouth for telemedicine sites, so each site pays $1,500 per month for 74 hours of utilization. Each site incurs utilization time per connection; however, BellSouth has agreed to average the utilization rate among telemedicine sites. The Economic Development Fund will subsidize half that amount for all telemedicine sites for the first 2 years and will also pay half the maintenance costs per site in Year Two (manufacturers' warranties cover Year One). A similar arrangement was negotiated for distance learning sites.

Whereas Georgia was fortunate with the initial funding of the statewide telemedicine system, it has been less so with the actual implementation of the system. Proponents of telemedicine have described the technology as off the shelf, but experience has demonstrated that this is not yet the case. In fact, the statewide system was to have been implemented by the end of 1994. The third quarter of 1995 is closing, and only 37 new sites have been installed, and only 3 original sites have been converted. Installation of equipment has not moved with the predicted speed, as a number of impediments have presented themselves. Key reasons

included the following: (1) no prototype of the new system was developed or tested prior to installation; (2) the integrator had little understanding of the clinical functionality necessary for a telemedicine system or the importance of system integrity. Integration standards for hub and remote sites had to be developed by the Telemedicine Center and the DOAS, and detailed validation procedures and oversight had to be implemented to ensure each site was installed to specifications; (3) the system required further improvements to meet the standards specified by the Telemedicine Center after the first 14 expansion sites had been installed. Further expansion was halted until these sites met specifications; (4) the room diagrams supplied were not to scale. Subsequently, when a cabinet item had to be enlarged to support a component whose specifications were not complete, 50 site configurations had to be reviewed, modified, and redrawn to scale; and (5) the initial plan to install four sites per week had to be modified to two sites per week because of the integrator capability and has since been scaled back to six sites per month.

TRAINING

The MCG established a standardized telemedicine program that encompasses clinical, operational, training, research and evaluation, and technology components. Each participating site agrees to function under these guidelines, which include the identification and support of a site coordinator. These persons are local residents who have typically been working within some capacity at the hospital, clinic, or correctional site. They have assumed the position of site coordinators because of their interpersonal communication skills and their familiarity with the staff, setting, and physical environment.

In order to make users acquainted with the actual operation of the telemedicine system, an intensive site-based training program has been developed, which is three-pronged. First, 3 days of on-site technical training is provided by the integrator, which includes the distribution of a technical training manual and hands-on training. Second, a 1-day operations training is conducted in a multipoint videoconferencing environment by Telemedicine Center staff, which includes distribution of an operations manual and interactive training sessions. This manual includes standardized forms that will be used to request telemedicine consultations and to document telemedicine activities, as well as delineating policies, procedures, and protocols.[5] The third component is a per-site follow-on training session conducted 7 to 10 working days after operations training, where additional technical and operational questions can be asked, and clinical vignettes are enacted. A fourth segment, the Telemedicine Standardized Patient Program, is designed to provide rural providers, site coordinators, and consultants with a more realistic setting for learning telemedicine. This developing program, recently funded by the Governing Board, is in response to requests from many of the new sites.

EVALUATION

Although telemedicine has existed in various forms for more than three decades, there has been little systematic investigation of its effects as a complete system of care. Bashshur et al[6] offered the first comprehensive survey of the field, but it was not until recently that others have begun to address the latent and manifest issues related to evaluation.[7-9] Cukor and Baer[10] describe human factors issues that should be considered, while several other research and evaluation projects are under way.[11,12]

The Georgia system is cooperating with the University of Michigan in a joint effort aimed at the comprehensive evaluation of the GSTP. The 3-year project was funded by the Health Care Financing Administration to answer basic questions regarding telemedicine's impact on accessibility, cost, and quality of care from the perspectives of clients, providers, and society at large. Of special significance is the assessment of telemedicine performance in the context of a statewide network rather than a single institutional program.

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